

Claims

1. A tubular polymerization reactor apparatus comprising:
 - (a) a source of fresh monomer;
 - (b) first and second compressor stages for compressing monomer;
 - (c) a reactor tube;
 - (d) multiple feeds, spaced lengthwise along the reactor tube for supplying monomer to the reactor;
 - (e) multiple free-radical or catalyst injection positions spaced lengthwise along the tubular reactor for causing monomer to be converted into polymer inside the tubular reactor;
 - (f) separators for receiving a monomer-polymer mixture from the reactor tube and separating said mixture into a volatile monomer-rich phase and molten polymerization phase;
 - (g) conduits for recycling the monomer-rich phase to the first and/or second compressor stages for recycling unreacted monomer to the reactor tube; and
 - (h) a source of transfer agent for modifying the molecular weight of the polymer for compression and feeding to the reactor tube;wherein compressor means is provided for compressing a transfer agent rich stream separately from a transfer agent-poor monomer stream and means is provided for feeding the compressed transfer agent rich stream to a polymerization reaction zone upstream of at least one reaction zone receiving the transfer agent-poor stream.
2. The reactor apparatus of Claim 1, wherein said transfer agent-poor stream contains less than 30 wt.% of the transfer agent relative to the transfer agent rich stream.
3. The reactor apparatus of Claim 1, wherein said transfer agent-poor stream contains 70 wt. % or less of the transfer agent relative to the transfer agent-rich stream.

4. The reactor apparatus of Claim 1, wherein said transfer agent-poor stream contains between 70 wt. % and 30 wt. % of the transfer agent relative to the transfer agent-rich stream.
5. The reactor apparatus of claim 1, wherein compressor means comprises a further compressor stage for an initial compression of the transfer agent obtained from the source of transfer agent, and a section of the second compressor stage, connected to the outlet of the further compressor stage for raising the gas stream containing transfer agent to a pressure suitable for supplying to the reactor, said section being optionally used additionally for compressing part of the monomer obtained from the outlet of the first compressor stage, said transfer agent being passed through conduits segregated from another section of the second compressor stage which is used for compressing the transfer agent-poor monomer stream.
6. The reactor apparatus of claim 1, wherein the transfer agent rich stream is connected to be introduced upstream of all reaction zones receiving a transfer agent-poor stream.
7. The reactor apparatus of claim 6, wherein the monomer-rich recycled stream from at least one of the separators is connected to be supplied to an extent exceeding 75% by volume to one or more reaction zones upstream of at least one downstream reaction zone.
8. The reactor apparatus of claim 7, wherein a recycled monomer-rich feed is connected to be supplied to an extent of from 75 to 100% of its volume to a reaction zone upstream of all other reaction zones spaced lengthwise along the tubular reactor.
9. The reactor apparatus of claim 5, wherein the transfer agent is connected to be passed from the further compressor stage and combined with the

recycled monomer-rich stream for compression in the segregated section of the second compressor stage.

10. The reactor apparatus of claim 9, wherein a pair of sources of transfer agents are arranged for connection to different reaction zones.